CLAIMS

1. A long superconductor, e.g. a superconducting tape or wire, with at least one polycrystalline superconducting compound deposited on a substrate, preferably on a buffer layer system on said substrate,
*wherein*
- a least one percolation path extends along the length of said tape, said path consisting of grains of said superconducting compound,
- the majority of said grains in said path have a shape such that their projection onto the surface of said substrate, being characterized by a length $L_{par}$ parallel to the longitudinal extension of the tape and a length $L_{per}$ perpendicular thereto, has an aspect ratio $a = L_{par}/L_{per}$ of at least 1.5, and
- the total volume $V$ of grains that are members of such one or more percolation paths exceeds 10% of the volume of said superconducting compound of said tape.

2. The superconductor of claim 1, *wherein*
at least 95% of the grains have the shape with the predetermined aspect ratio $a = L_{par}/L_{per}$ .

3. The superconductor according to claim 1 or 2, *wherein*
the aspect ratio $a = L_{par}/L_{per}$ is determined by the microstructure of the substrate, in particular by the structure of its surface.

4. The superconductor according to any preceding claim 1, *wherein*
the aspect ratio $a = L_{par}/L_{per}$ is determined by the shape of the grains forming the surface of the substrate, in particular the aspect ratio of said grains.

5. The superconductor according to any preceding claim 1, *wherein* the aspect ratio a is determined by the microstructure of the buffer layer system, in particular by the aspect ratio of its grains at the interface to the superconductor.

6. The superconductor according to any preceding claim, *wherein* $a > 4$.

7. The superconductor according to any preceding claim, *wherein* $V > 25\%$.

8. The superconductor according to any preceding claim, *wherein* the buffer layer system consists of a single layer only.

9. The superconductor according to any preceding claim, *wherein* the at least one polycrystalline superconducting compound is directly deposited on the substrate without intermediate buffer layer.

10. The superconductor according to any preceding claim, *wherein* the superconducting compound is a cuprate.

11. The superconductor according to any preceding claim, *wherein* the superconducting compound belongs to the $ReBa_2Cu_3O_{7-\delta}$ family, Re being a rare earth including La or Y.

12. The superconductor according to any preceding claim, *wherein* the superconductor compound is a multilayer arrangement whose layers have different compositions.

13. The superconductor according to any preceding claim, *wherein* the grains are aligned such that the average misorientation angle is below 20°.

14. The superconductor according to any preceding claim, *wherein* the average misalignment of the A-axis of the grains is below 20°.

15. The superconductor according to any preceding claim, *wherein* the substrate is a metallic tape such as steel or Ni alloy with a thickness in the range of 20 to 100 μm, whose surface grain orientation is appropriately aligned.

16. The superconductor according to any preceding claim, *wherein* the buffer layer comprises a plurality of sublayers such as $CeO_2$/YsZ/$CeO_2$ and/or the superconductor is of the $ReBa_2Cu_3O_{7-\delta}$ family, Re being a rare earth, including La or Y.

17. A method for making a long superconductor, e.g. a tape or wire, by depositing at least one polycrystalline superconducting compound onto a substrate, preferably onto an intermediate buffer layer system on said substrate,
*characterized by*

- producing at least one percolation path along the length of said superconductor, each said path consisting of grains of said superconducting compound,
- aligning a vast majority of said grains in said percolation path to the longitudinal extension of said superconductor such that the area of each said grain projected onto the substrate surface, characterized by a length $L_{par}$ parallel to the longitudinal direction of said superconductor and a length $L_{per}$ perpendicular to said longitudinal direction, results in an aspect ratio $a$ =

$L_{par}/L_{per}$ exceeding 2, and

- achieving a volume of $V > 10\%$ of said grains forming said one or more percolation paths of the total volume of said superconducting compound.

18. The method according to claim 17, *wherein*
the aligning step is executed by controlling the microstructure of the substrate, in particular by mechanical treatment of said substrate for producing small grooves in its surface.

19. The method according to claim 17, *wherein*
the microstructure of the substrate is controlled by atom-beam treatment.

20. The method according to claim 17, *wherein*
the microstructure of the substrate is controlled by polishing the substrate's surface.

21. The method according to any of the claims 17 to 20, *wherein*
the microstructure control steps are executed and/or repeated until an average angular misorientation of less than 15° is achieved.

22. The method according to any of the claims 17 to 21, *wherein*
the deposition of the superconductor is performed from the vapor phase.

23. The method according to any of the claims 17 to 22, *wherein*
the deposition of the superconductor is performed from a solution.

24. An at least partly superconducting object, particularly a wire or cable, *comprising*
a superconductor according to any of the claims 1 to 16 and/or fabricated according to any of the claims 17 to 23.